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DESIGNATED/ELECTED OFFICE (DO/EO/US)
CONCERNING A FILING UNDER 35 U.S.C. 371

ATTORNEY'S DOCKET NUMBER: BIF103835	
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INTERNATIONAL APPLICATION NO.: PCT/FR00/00202	INTERNATIONAL FILING DATE: 28 JANUARY 2000
PRIORITY DATE CLAIMED: 1 FEBRUARY 1999	

TITLE OF INVENTION: THERMAL PROTECTION SHEATH AND ITS FABRICATION METHOD

APPLICANT(S) FOR DO/EO/US: Frédéric LOUART, Jean FERRAND, Lionel DROMAIN, Dirk STEITZ

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. [X] This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. [ ] This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. [X] This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).
4. [X] A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. [X] A copy of the International Application as filed (35 U.S.C. 371(c)(2))
   a. [X] is transmitted herewith (required only if not transmitted by the International Bureau).
   b. [ ] has been transmitted by the International Bureau. (see attached copy of PCT/IB/308)
   c. [ ] is not required, as the application was filed in the United States Receiving Office (RO/US).
6. [X] A translation of the International Application into English (35 U.S.C. 371(c)(2)).
7. [ ] Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3)).
   a. [ ] are transmitted herewith (required only if not transmitted by the International Bureau).
   b. [ ] have been transmitted by the International Bureau.
   c. [ ] have not been made; however, the time limit for making such amendments has NOT expired.
   d. [ ] have not been made and will not be made.
8. [ ] A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. [X] An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. [ ] A translation of the annexes of the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Item 11. to 16. below concern document(s) or information included:

11. [X] An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. [X] An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. [X] A **FIRST** preliminary amendment.
    [ ] A **SECOND** or **SUBSEQUENT** preliminary amendment.
14. [ ] A substitute specification.
15. [ ] A change of power of attorney and/or address letter.
16. [X] Other items or information:

International Search Report
PCT/IPEA/409
Abstract of the Disclosure on a Separate Sheet
Application Data Sheet

U.S. APPLICATION NO. (if known, see 37 CFR 1.) 09/890530	INTERNATIONAL APPLICATION NO. PCT/FR00/00202	ATTORNEY'S DOCKET NO. BIF103835

	CALCULATIONS PTO USE ONLY
17. [X] The following fees are submitted:	
BASIC NATIONAL FEE (37 CFR 1.492(a)(1)-(5)):	
Neither international preliminary examination fee (37 CFR1.482) nor international search fee (37 CFR1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO . . . . . $ 1,000.00	
International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO . . . . . $ 860.00	
International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO . . . . . $ 710.00	
International preliminary examination fee (37 CFR 1.482) paid to USPTO but all claims did not satisfy provisions of PCT Article 33(1)-(4) . . . . . $ 690.00	
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ENTER APPROPRIATE BASIC FEE AMOUNT =	$ 860.00
Surcharge of $130.00 for furnishing the oath or declaration later than months from the earliest claimed priority date (37 CFR 1.492(e)).	$

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE	$
Total claims	21 - 20 =	1	X $18.00	$ 18.00
Independent claims	2 - 3 =	0	X $80.00	$
MULTIPLE DEPENDENT CLAIMS(S) (if applicable)			+ $270.00	$
			TOTAL OF ABOVE CALCULATIONS =	$ 878.00
Reduction of ½ for filing by small entity, if applicable. Applicant claims Small Entity Status under 37 CFR 1.27. +				$
			SUBTOTAL =	$ 878.00
Processing fee of $130 for furnishing the English translation later than months from the earliest claimed priority date (37 CFR1.49(f)).				$
			TOTAL NATIONAL FEE =	$ 878.00
Fee for recording the enclosed assignment (37 CFR1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). $40.00 per property +				$ 40.00
			TOTAL FEES ENCLOSED =	$ 918.00
			Amount to be refunded:	
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a. [X] A check in the amount of $ **918.00** to cover the above fees is enclosed.

b. [ ] Please charge my Deposit Account No. **25-0120** in the amount of $ to cover the above fees. A duplicate copy of this sheet is enclosed.

c. [X] The Commissioner is hereby authorized to charge any additional fees which may be required by 37 CFR 1.16 and 1.17, or credit any overpayment to Deposit Account No. **25-0120**. A duplicate copy of this sheet is enclosed.

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August 1, 2001

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PATENTS

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of

Frédéric LOUART et al.

Serial No. (unknown)

Filed herewith

THERMAL PROTECTION SHEATH AND
ITS FABRICATION METHOD

PRELIMINARY AMENDMENT

Commissioner for Patents

Washington, D.C. 20231

Sir:

Prior to calculation of the filing fee, please amend the above-identified application as follows:

IN THE CLAIMS:

Cancel claims 1-22.

Add the following new claims:

--23. (new) A thermal protection sheath including a substrate (10) and a reflective foil (20) fixed to the substrate (10, 14), the substrate (10, 14) being elastically deformable from a relaxed configuration, characterized in that the foil (20) is pleated on the substrate (10, 14) in said relaxed configuration and the pleats in the foil (20) are irregularly shaped and oriented.

--24. (new) A protection sheath according to claim 23, characterized in that the substrate (10, 14) has

an outside surface (11) provided with openings (12) and the foil (20) is pleated in line with said openings (12).

--25. (new) A protection sheath according to claim 24, characterized in that the foil (20) is pleated inside the openings (12).

--26. (new) A protection sheath according to claim 23, characterized in that the pleats in the foil (20) are adapted to form reserves of air (15).

--27. (new) A protection sheath according to claim 23, characterized in that the substrate (10) is made of textile and includes openings (12) between textile threads (13) and the foil (20) is pleated in line with said openings (12).

--28. (new) A protection sheath according to claim 27, characterized in that the substrate (10) is formed of braided or knitted threads (13).

--29. (new) A protection sheath according to claim 28, characterized in that the reflective foil (20) is pleated between the braided or knitted threads (13).

--30. (new) A protection sheath according to claim 23, characterized in that the substrate is a corrugated plastics material tube (14).

--31. (new) A protection sheath according to claim 30, characterized in that the corrugated plastics material tube (14) is slit longitudinally.

--32. (new) A protection sheath according to claim 30, characterized in that the foil (20) is pleated inside annular recesses (12) of the corrugated tube (14).

--33. (new) A protection sheath according to claim 23, characterized in that the substrate (10, 14) is tubular.

--34. (new) A protection sheath according to claim 23, characterized in that the substrate (10, 14) can be stretched elastically in the longitudinal and/or radial direction.

--35. (new) A protection sheath according to claim 23, characterized in that the reflective foil (20) is woven from aluminized glass fibers.

--36. (new) A method of fabricating a protection sheath including a substrate (10, 14) and a reflective foil (20) adapted to be fixed to said substrate (10, 14), characterized in that it includes the following steps:

- elastically stretching the substrate (10, 14) from a relaxed configuration;
- fixing the reflective foil (20) to the stretched substrate (10, 14); and

- elastically shrinking the substrate (10, 14) into said relaxed configuration.

--37. (new) A fabrication method according to claim 14, characterized in that, in the stretching step, the substrate (10, 14) is stretched longitudinally and/or radially.

--38. (new) A fabrication method according to claim 36, characterized in that the shrinking of the substrate (10, 14) covered with the reflective foil (20) is forced by means of rollers (22a, 22b) adapted to press said foil (20) onto the substrate (10, 14).

--39. (new) A fabrication method according to claim 36, characterized in that the foil (20) is pleated inside openings (12) in the substrate (10, 14) during the shrinkage step.

--40. (new) A fabrication method according to claim 36, characterized in that, in the fixing step, the reflective foil (20) is applied in the lengthwise direction of the substrate (10, 14).

--41. (new) A fabrication method according to claim 36, characterized in that the reflective foil (20) is applied in a helix around the substrate (10, 14).

--42. (new) A fabrication method according to claim 36, characterized in that, in the fixing step, the

reflective foil (20) is fixed to the substrate (10, 14) by an adhesive.

--43. (new) A fabrication method according to claim 36, characterized in that the substrate (10) includes braided or knitted heat-shrink threads (13) and in that during the step of shrinking the substrate (10) the sheath is heated to shrink the heat-shrink threads (13).

R E M A R K S

The above changes in the claims merely place this national phase application in the same condition as it was during the international phase, with the multiple dependencies being removed. Following entry of this amendment, the claims now in the case are claims 23-43.

Respectfully submitted,

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ABSTRACT OF THE DISCLOSURE

A heat-reflective protective sleeve includes a substrate (10) and a sheet of reflective material (20) fixed on the substrate (10). The substrate (10) is elastically deformable from a non-operating position and the sheet (20) is pleated on the substrate (10) in the non-operating position.

"A thermal protection sheath and its fabrication method"

The present invention relates to a thermal protection sheath and its fabrication method.

Thermal protection sheaths are routinely used to insulate fluid pipes, for example in automobile vehicles, and in particular in hydraulic circuits, fuel lines, brake fluid lines, cooling fluid lines and conditioned air lines.

This kind of thermal protection sheath includes a substrate covered with a reflective material adapted to reflect infrared radiation.

The substrate must be sufficiently flexible to adapt to various shapes of pipe and cover them without creasing.

A first technique for covering the substrate with a reflective material consists in applying a coating containing particles of aluminum, for example, directly to the outside surface of the substrate.

This kind of aluminized coating preserves good flexibility of the substrate of the protective sheath but has limited reflection properties. This is because the binder used to fix the aluminum particles to the surface of the substrate absorbs some thermal radiation and thereby limits the reflective power of the aluminized coating.

A second technique consists in fixing a reflective foil, such as aluminum foil or aluminized film, to the outside surface of the substrate.

These foils and films improve the thermal protection provided by the sheath but lack flexibility. In particular, the foils tend to tear if the sheath is deformed, and in particular if it is stretched.

US patent 5,660,899 describes a thermal protection sheath comprising a substrate formed by a corrugated plastics material tube covered with a laminated structure glued at all points to the outside surface of the

substrate.

The laminated structure and the substrate therefore have exactly the same corrugated tube form and the laminated structure and the substrate are in contact over their entire surface.

An object of the present invention is to propose a flexible and deformable thermal protection sheath having satisfactory heat-reflecting properties.

The thermal protection sheath according to the invention includes a substrate and a reflective foil fixed to the substrate, the substrate being elastically deformable from a relaxed configuration.

According to the invention the foil is pleated on the substrate in said relaxed configuration.

The reflective foil is therefore pleated on the elastic substrate in order not to impede deformation of the thermal protection sheath, which can therefore be fitted without difficulty to pipes of various shapes, and in particular bent pipes.

This is because the foil, forming pleats on the substrate, is in contact with the outside surface of the substrate only at certain points and has an external shape different from that of the substrate.

The pleated structure of the reflective foil absorbs deformation of the sheath, the reflective foil becoming respectively more pleated or less pleated as the sheath is compressed or stretched.

The pleats in the reflective foil on the substrate are advantageously adapted to form reserves of air that further improve the thermal insulation of pipes protected by the sheath.

According to one preferred feature of the invention, the substrate has an outside surface provided with openings and the foil is pleated in line with said openings.

Accordingly, on elastic deformation of the sheath, the shape of the openings is modified and the reflective foil can be pleated more or pleated less in line with these openings.

Preferably, the foil is pleated inside the openings.

This further improves the mechanical strength of the thermal protection sheath, the foil forming substantially no pleats projecting on the outside surface of the sheath. The thermal protection sheath therefore has improved resistance to contact wear.

In another aspect, the present invention provides a method of fabricating a protection sheath including a substrate and a reflective foil adapted to be fixed to said substrate.

According to the invention, the fabrication method includes the following steps:

- elastically stretching the substrate from a relaxed configuration;
- fixing the reflective foil to the stretched substrate; and
- elastically shrinking the substrate into said relaxed configuration.

This fixing the reflective foil directly to the stretched substrate forms the pleats when the substrate shrinks elastically.

Thus the elastic properties of the substrate are used to form the pleats in the reflective foil.

In accordance with one advantageous feature of the invention the shrinking of the substrate covered with the reflective foil is forced by means of rollers adapted to press said foil onto the substrate.

The rollers therefore hold the foil in contact with the outside surface of the substrate even when the latter shrinks, in particular radially.

In accordance with a preferred feature of the invention the foil is pleated inside openings in the substrate during the shrinkage step.

As previously described, the pleats formed by the foil are formed inside the openings in the substrate and do not project from the thermal protection sheath.

According to one advantageous feature of the invention, the substrate includes braided or knitted heat-shrink threads and during the step of shrinking the substrate the sheath is heated to shrink the heat-shrink threads.

Thermal shrinkage of the sheath facilitates the formation of pleats in the foil on the substrate.

Other features and advantages of the invention will become more apparent in the course of the following description.

In the accompanying drawings, which are provided by way of non-limiting example:

- figure 1 is a front view of a thermal protection sheath in accordance with a first embodiment of the invention;

- figure 2A is a perspective view of a portion of the sheath shown in figure 1;

- figure 2B is a view in cross section of the sheath portion shown in figure 2A;

- figure 3 is a perspective view of a thermal protection sheath according to a second embodiment of the invention;

- figure 4 is a perspective view of a thermal protection sheath according to a third embodiment of the invention;

- figure 5 is a view in longitudinal section of the thermal protection sheath shown in figure 4;

- figure 6 shows a fabrication method according to a first embodiment of the invention;

- figure 7 shows diagrammatically rollers used in the fabrication method according to the invention;

- figure 8 shows a fabrication method according to a second embodiment; and

- figure 9 shows a shrinkage step in a preferred embodiment of the fabrication method according to the invention.

A thermal protection sheath according to a first embodiment of the invention is described first and with reference to figures 1, 2A and 2B.

The sheath includes a substrate 10 and a reflective foil 20 fixed to the substrate 10.

In this example the substrate is tubular and is formed from knitted threads 13.

Because of the knitted structure of the substrate, the latter has a capacity for elastic expansion in the longitudinal and radial direction. It is therefore elastically deformable, which facilitates fitting it over the pipe to be protected, and can be adapted to diverse pipe shapes.

The textile can be knitted directly in tubular form, to form a tubular substrate 10, or knitted flat and only afterwards rolled to form a tube.

Any material can be used for the threads, in particular glass fibers, polyamide fibers or polyester fibers.

The substrate 10 is therefore a textile substrate, with openings 12 between the threads 13.

As shown in figure 1, the substrate 10 has an outside surface provided with openings 12 thanks to the meshes formed by the knitted threads 13.

In accordance with the invention, a reflective foil 20 is fixed to the substrate. The foil 20 forms pleats on the outside surface of the substrate 10 in the rest position shown in figure 1.

As shown better in figures 2A and 2B, the foil is fixed to the fibers 13 of the substrate 10 and is pleated inside the existing openings 12 between the knitted threads 13.

The foil 20 therefore forms small irregular pleats in the openings 12, disposed in all directions on the outside surface of the substrate 10.

The reflective foil 20 is woven from aluminized glass fibers, for example. It is therefore not elastically deformable in itself, but, thanks to its pleated structure on the substrate 10, it does not impede elastic deformation thereof, and consequently elastic deformation of the thermal protection sheath. The pleats in the reflective foil 20 prevent the sheath from tearing.

When the thermal protection sheath shown in figures 1, 2A and 2B is fitted to a fluid pipe, such as a hydraulic pipe, for example, the pleats of the reflective foil 20 in line with the openings 12 in the substrate 10 form reserves or pockets of air on the outside surface of the pipe and therefore improve its thermal insulation relative to surrounding sources of heat.

Of course, the substrate 10 could equally be made from various textile materials, and in particular formed from braided threads 13, as shown in figure 3.

The threads used can be monofilament threads or multifilament threads and the braided textile preferably includes a mixture of monofilament threads and multifilament threads to confer on it good mechanical strength combined with great elasticity.

In this case, the elastic expansion can be radial, when the braided substrate is compressed longitudinally, or longitudinal, when the braided substrate is stretched longitudinally.

A thermal protection sheath according to a third embodiment of the invention is described next with

reference to figures 4 and 5.

In this example, the substrate is in the form of a corrugated plastics material tube 14.

The corrugated plastics material tube can be slit longitudinally before applying the reflective foil 20.

The substrate 14 has an outside surface 11 provided with openings 12 in line with the annular recesses 12 in the corrugated tube 14.

As shown clearly in figure 5, a reflective foil 20 fixed to the outside surface 11 of the substrate 14 is pleated opposite the openings 12, inside the annular recesses 12.

Because of its corrugated structure, the substrate 14 can be stretched elastically in the longitudinal direction.

Accordingly, when it is stretched in the lengthwise direction, it is able to deform at the level of the annular recesses 12 in particular because of the pleated structure of the reflective foil 20 inside the annular recesses 12.

In this embodiment, as shown in figure 5, the pleats formed by the reflective foil 20 inside the annular recesses 12 create reserves or pockets of air 15 on the outside surface 11 of the substrate 10. These reserves 15 of air further improve the thermal insulation capacity provided by the sheath when fitted to a pipe.

The pleats formed in the annular recesses 12 are also irregular in shape and in orientation inside the annular recesses 12.

The various embodiments of the protection sheath can be slit longitudinally to facilitate fitting the sheath to a pipe. It is easier to slit the corrugated substrate longitudinally before applying the reflective foil.

The sheath has an inside diameter from 5 mm to 65 mm, for example.

A method of fabricating a thermal protection sheath

according to the invention is described next, firstly with reference to figure 6.

In this example, the substrate 10 is a braided textile tube. Of course, an analogous fabrication process can be used for a different substrate, and in particular a substrate in the form of a corrugated tube 14, preferably slit longitudinally, or a knitted textile substrate.

The fabrication method includes firstly a step of elastically stretching the substrate 10 from a relaxed configuration.

Here the braided substrate 10 is elastically stretched in the radial direction.

The substrate 10 can be stretched elastically along a continuous line by passing the substrate over a cylindrical mandrel whose diameter is greater than the inside diameter of the substrate 10 in the relaxed configuration.

In the case of a knitted structure, as shown in figures 1, 2A and 2B, the substrate 10 is elastically stretched in the longitudinal and radial directions to increase its length and its radius.

In a second step of the fabrication process the reflective foil 20 is fixed to the stretched substrate 10.

In this embodiment, the reflective foil 20 is laminated onto the substrate 10 in the lengthwise direction of the substrate 10.

In this example two strips of reflective material 20 are fixed to two opposite faces of the expanded substrate 10.

As shown in figure 7, rollers 21 with a concave profile 21a are adapted to apply a strip of reflective material to a respective half-circumference of the expanded substrate 10.

Figure 6 shows a small area 20a of overlap providing a perfect joint between the two strips of

reflective material 20 on the substrate 10.

Of course, a different number of strips and rollers 21 for applying them to the substrate 10 could be used, in particular four rollers disposed in quadrature about the tubular substrate 10 and in pairs in two transverse planes offset lengthwise of the tubular substrate 10.

As shown in figure 8, when fixing the reflective foil 20 to the stretched substrate 10, the foil 20 could equally be applied in a helix around the substrate 10.

The reflective foil 20 is fixed to the substrate 10 by means of an adhesive.

In the conventional way, that adhesive can be a thermoplastic or thermosetting glue or a pressure-sensitive adhesive.

Hot air jets or heated rollers 21 can be used if the adhesive must be heated to glue the reflective foil 20 to the substrate 10.

A double-sided adhesive can be applied to the reflective foil 20 before fixing it to the substrate 10. Alternatively, a double-sided adhesive can be applied directly during lamination of the reflective foil 20 to the substrate 10, between the foil 20 and the substrate 10.

The substrate 10 then shrinks elastically into its relaxed configuration on leaving the mandrel used during stretching it and fixing the reflective foil 20.

The elastic shrinkage can be unforced and obtained simply by the elastic return of the stretched substrate to its relaxed configuration.

As shown in figure 9, the elastic shrinkage of the substrate 10 covered with the reflective foil 20 can be forced by means of rollers 22a, 22b adapted to press the foil 20 onto the substrate 10.

In this embodiment, two pairs of rollers 22a and 22b are used, disposed along the path of the thermal protection sheath after leaving the mandrel.

The rollers 22a and 22b have a semicircular concave profile similar to that of the rollers 21 used for fixing the foil 20 and shown in figure 7.

The radius of the semicircular profile of the rollers 22a and 22b decreases in the direction in which the thermal protection sheath moves on leaving the mandrel to accommodate radial shrinkage of the elastic substrate 10.

Furthermore, the speed of the rollers 22a that are on the upstream side relative to the direction of movement of the thermal protection sheath on leaving the mandrel is higher than the speed of the downstream rollers 22b.

The speed ratio provides some lengthwise shrinkage of the substrate 10 on leaving the mandrel.

The rollers 22a and 22b therefore facilitate elastic shrinkage of the substrate 10 and adhesion of the reflective foil 20 to the substrate 10.

Also, the foil 20 is introduced into and pleated inside the openings in the substrate during this shrinkage step so that the pleats formed do not project from the substrate 10 but instead lie inside the openings 12.

If the substrate includes braided or knitted heat-shrink threads, during the step of shrinking the substrate 10 the sheath can preferably be heated to shrink the heat-shrink threads.

The rollers 22a and 22b used during this shrinkage step can therefore be heated.

The invention provides a thermal protection sheath having a good capacity for elastic stretching limited only by elastic stretching of the substrate 10 itself or unpleating of the reflective foil 20.

Of course, many modifications can be made to the embodiment described above without departing from the scope of the invention.

In particular, the substrate can be stretched longitudinally and/or radially during the stretching step.

Also, during elastic shrinkage of the substrate, the thermal protection sheath could travel over a path defined by rods curved in all directions in space to ensure uniform shrinkage of the substrate 10 and uniform pleating of the reflective foil 20.

The number of rollers 22a, 22b used when shrinking the sheath can be less than or greater than the two pairs of rollers 22a, 22b described in the above embodiment.

The reflective foil used can be a foil made from any synthetic polymer that is metallized and in particular chromium-plated.

CLAIMS

1. A thermal protection sheath including a substrate (10) and a reflective foil (20) fixed to the substrate (10, 14), the substrate (10, 14) being elastically deformable from a relaxed configuration, characterized in that the foil (20) is pleated on the substrate (10, 14) in said relaxed configuration.

2. A protection sheath according to claim 1, characterized in that the substrate (10, 14) has an outside surface (11) provided with openings (12) and the foil (20) is pleated in line with said openings (12).

3. A protection sheath according to claim 2, characterized in that the foil (20) is pleated inside the openings (12).

4. A protection sheath according to any of claims 1 to 3, characterized in that the pleats in the foil (20) are irregularly shaped and oriented.

5. A protection sheath according to any of claims 1 to 4, characterized in that the pleats in the foil (20) are adapted to form reserves of air (15).

6. A protection sheath according to any of claims 1 to 5, characterized in that the substrate (10) is made of textile and includes openings (12) between textile threads (13) and the foil (20) is pleated in line with said openings (12).

7. A protection sheath according to claim 6, characterized in that the substrate (10) is formed of braided or knitted threads (13).

8. A protection sheath according to claim 7, characterized in that the reflective foil (20) is pleated between the braided or knitted threads (13).

9. A protection sheath according to any of claims 1 to 5, characterized in that the substrate is a corrugated plastics material tube (14).

10. A protection sheath according to claim 9, characterized in that the corrugated plastics material tube (14) is slit longitudinally.

11. A protection sheath according to claim 9 or claim 10, characterized in that the foil (20) is pleated inside annular recesses (12) of the corrugated tube (14).

12. A protection sheath according to any of claims 1 to 11, characterized in that the substrate (10, 14) is tubular.

13. A protection sheath according to any of claims 1 to 12, characterized in that the substrate (10, 14) can be stretched elastically in the longitudinal and/or radial direction.

14. A protection sheath according to any of claims 1 to 13, characterized in that the reflective foil (20) is woven from aluminized glass fibers.

15. A method of fabricating a protection sheath including a substrate (10, 14) and a reflective foil (20) adapted to be fixed to said substrate (10, 14), characterized in that it includes the following steps:

- elastically stretching the substrate (10, 14) from a relaxed configuration;

- fixing the reflective foil (20) to the stretched substrate (10, 14); and

- elastically shrinking the substrate (10, 14) into said relaxed configuration.

16. A fabrication method according to claim 15, characterized in that, in the stretching step, the substrate (10, 14) is stretched longitudinally and/or radially.

17. A fabrication method according to either claim 15 or claim 16, characterized in that the shrinking of the substrate (10, 14) covered with the reflective foil (20) is forced by means of rollers (22a, 22b) adapted to press said foil (20) onto the substrate (10, 14).

18. A fabrication method according to any of claims 15 to 17, characterized in that the foil (20) is pleated inside openings (12) in the substrate (10, 14) during the shrinkage step.

19. A fabrication method according to any of claims 15 to 18, characterized in that, in the fixing step, the reflective foil (20) is applied in the lengthwise direction of the substrate (10, 14).

20. A fabrication method according to any of claims 15 to 18, characterized in that the reflective foil (20) is applied in a helix around the substrate (10, 14).

21. A fabrication method according to any of claims 15 to 20, characterized in that, in the fixing step, the reflective foil (20) is fixed to the substrate (10, 14) by an adhesive.

22. A fabrication method according to any of claims 15 to 21, characterized in that the substrate (10) includes braided or knitted heat-shrink threads (13) and in that during the step of shrinking the substrate (10) the sheath is heated to shrink the heat-shrink threads (13).

FIG. 1

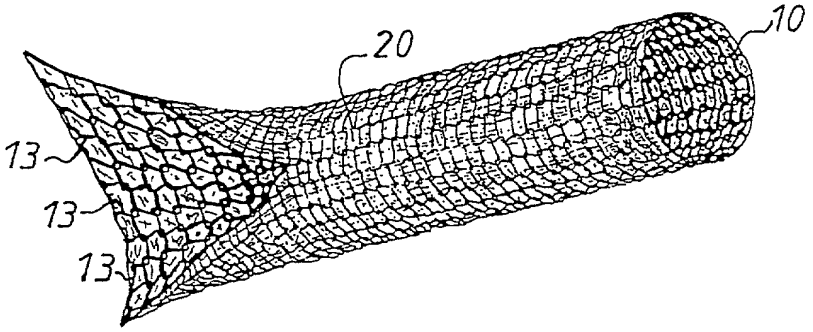


FIG. 2A

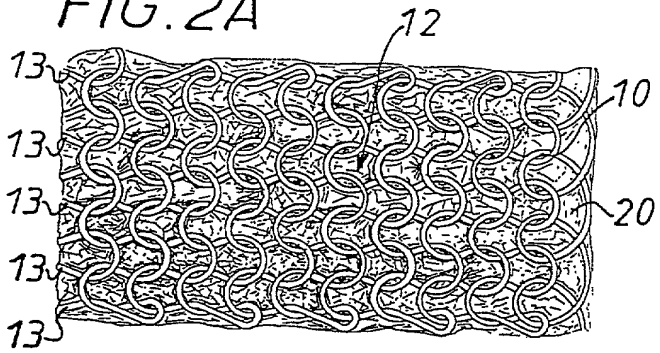


FIG. 2B

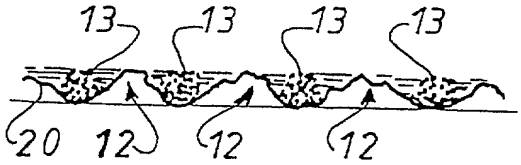


FIG. 3

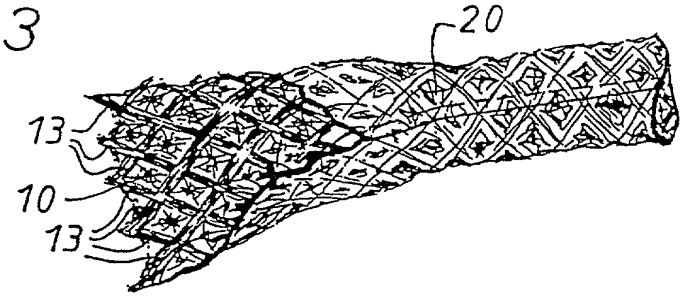


FIG. 4

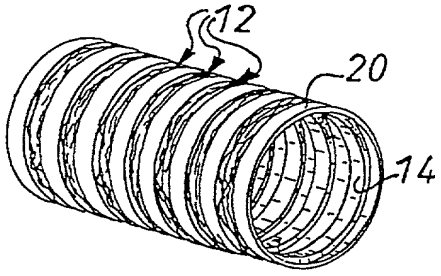


FIG. 5

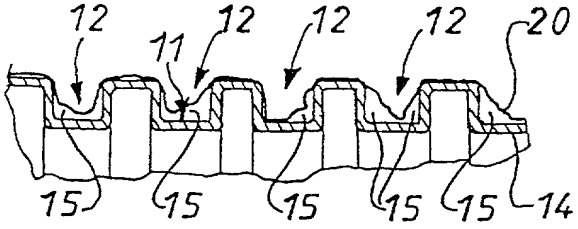


FIG. 6

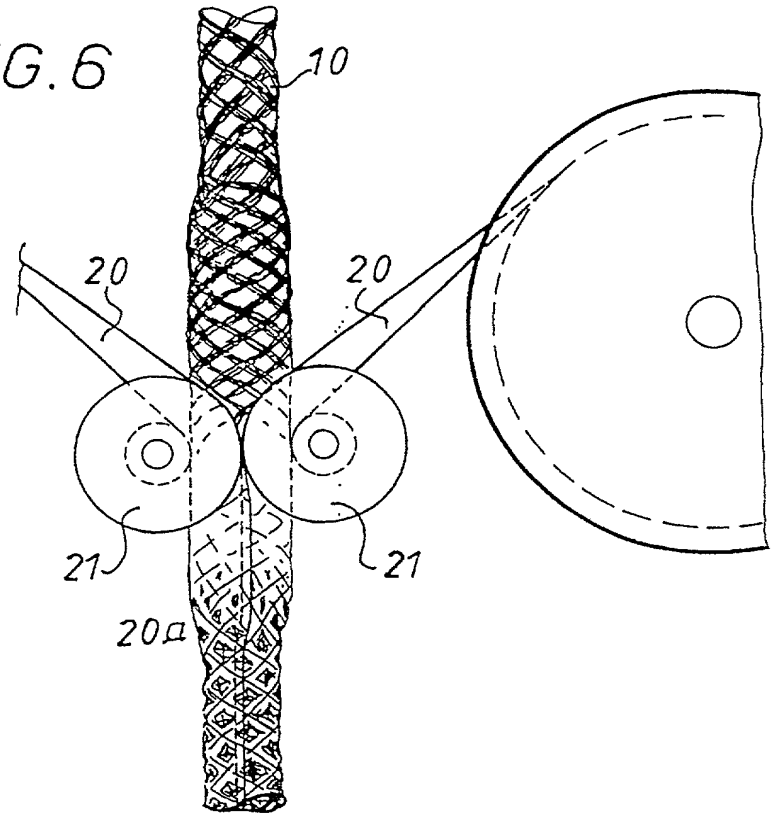


FIG. 7

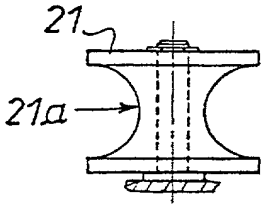


FIG. 8

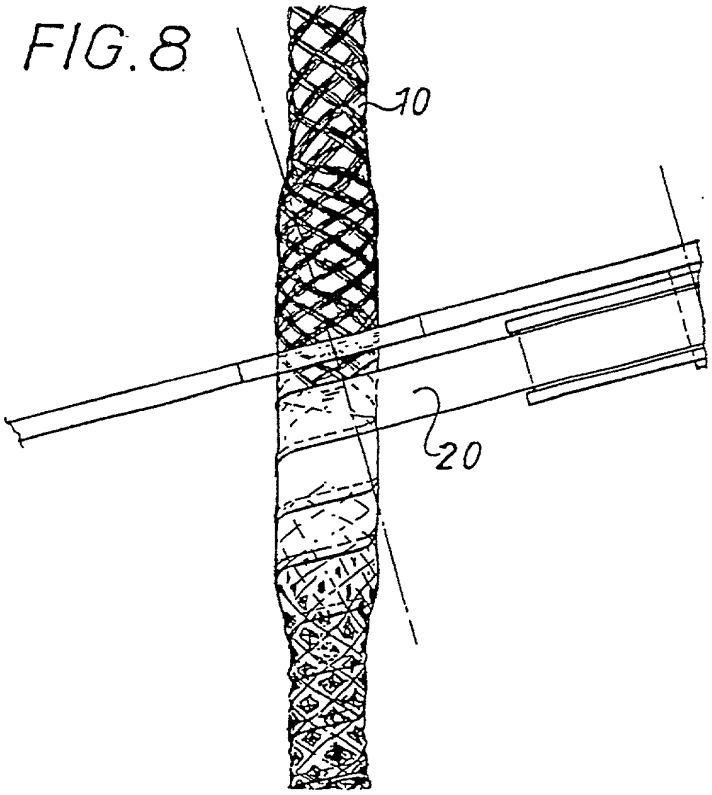
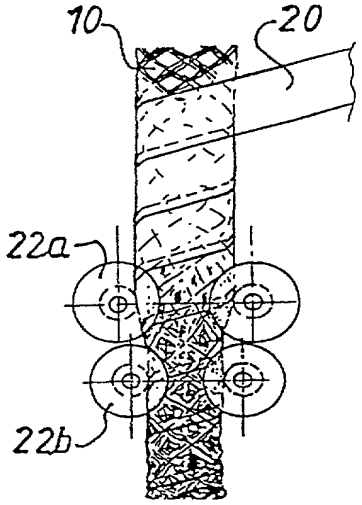


FIG. 9



Declaration and Power of Attorney For Patent Application
Declaration Pour Demandes de Brevets Avec Pouvoirs

French Language Declaration

En tant qu' inventeur nommé ci-après, Je déclare par le présent acte que:

As a below named inventor, I hereby declare that:

Mon nom, mon domicile, mon adresse postale, ma nationalité sont ceux qui figurent ci-après,

My residence, post office address and citizenship are as stated below next to my name,

Je déclare que je crois être l'inventeur original, premier et unique (si un seul nom figure sur le présent acte) ou un des co-inventeurs, originaux et premiers (si plusieurs noms figurent sur le present acte) du sujet revendiqué et pour lequel un brevet est demandé sur la base de l'invention intitulée:

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

A thermal protection sheath and its fabrication method.

dont la description
(cocher la case correspondante)

the specification of which
(check one)

☐ est annexée au présent acte.

☒ is attached hereto.

☐ a été déposée _____

☐ was filed on _____ as

Numéro de série de la demande _____

Application Serial No. _____

et modifiée le _____
(si approprié)

and was amended on _____
(if applicable)

Je déclare par le présent acte avoir examiné et compris le contenu de la description identifiée ci-dessus, revendications y compris, et le cas échéant telle que modifiée par l'amendment cité plus haut.

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

Je reconnais le devoir de divulguer l'information qui est en rapport avec l'examen de cette demande selon Titre 37 du Code des Reglements Fédéraux §1.56(a).

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, §1.56(a).

French Language Declaration

Je revendique par le présent acte le bénéfice de priorité étrangère selon Titre 35, du Code des Etats-Unis, §119 de toute demande de brevet ou d'attestation d'inventeur énumérée ci-après, et j'ai identifié également ci-après toute demande étrangère de brevet ou d'attestation d'inventeur ayant une date de dépôt antérieure à celle de la demande pour laquelle la priorité est revendiquée.

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior foreign applications

Demande(s) de brevet antérieure(s) dans un autre pays:

(Number) (Numéro)	(Country) (Pays)	(Day/Month/Year Filed) (Jour/Mois/Année de dépôt)	Priority claimed / Droit de priorité revendiqué: Yes / Oui	No / Non
9901099	FRANCE	February 1, 1999	☒	☐
			☐	☐
			☐	☐

Je revendique par le présent acte, le bénéfice selon Titre 35 du Code des Etats-Unis, §120 de toute(s) demande(s) américaines énumérée(s) ci-après et, dans la mesure où le sujet de chacune des revendications de cette demande n'est pas divulgué dans la demande américaine antérieure, de la façon définie par le premier paragraphe de Titre 35 du Code des Etats-Unis, §112, je reconnais le devoir de divulguer l'information pertinente selon Titre 37 du Code des Réglements Fédéraux, §1.56(a), toute information qui se présente entre la date de dépôt de la demande antérieure et la date de dépôt de la demande, soit nationale, soit internationale PCT.

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

(Application Serial No.) (No. de Demande)	(Filing Date) (Date de Dépôt)	(Etat) (brevetée, pendante, abandonné)	(Status) (patented, pending, abandoned)

Je déclare par le présent acte que toutes mes déclarations, à ma connaissance, sont vraies et que toutes les déclarations faites à partir de renseignements ou de suppositions, sont tenues pour être vraies; de plus, toutes ces declarations ont été faites en sachant que de fausses déclarations volontaires u autres actes de même nature sont sanctionées par une amende ou un emprisonnement, ou les deux, selon la Section 1001, du Titre 18 de Code des Etats-Unis et que de selles déclarations délibérément fausses peuvent compromettre la validité de la demande ou du brevet délivré.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

French Language Declaration

POUVOIR: En tant qu'inventeur, je désigne l'(les) avocat(s) et/ou l'(les) agent(s) suivant(s) pour poursuivre la procédure de cette demande et traiter toute affaire la concernant supris du Bureau des Brevets et de Marques:

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith. (*list name and registration number*)

7-

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ANDREW J. PATCH, Reg. N° 32,925
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ROBERT J. PATCH, 703/521-2297

Nom complet du seul ou premier inventeur 100	Full name of sole or first inventor LOUART Frédéric
Signature de l'inventeur Date	Inventor's signature Date Frédéric Louart 12/07/01
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Signature de l'inventeur Date	Second Inventor's signature Date 6/7/01
Domicile	Residence 20, rue des Capucines, 60800 CREPY-EN-VALOIS
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(Fournir les mêmes renseignements et la signature de tout co-inventeur supplémentaire.)

(Supply similar information and signature for third and subsequent joint inventors.)

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Signature de l'inventeur Date	Inventor's signature Date D. Steitz 12 July 01
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Nom complet du cinquième co-inventeur	Full name of fifth joint inventor
Signature de l'inventeur Date	Inventor's signature Date
Domicile	Residence
Nationalité	Citizenship
Adresse postale	Post Office Address
Nom complet du sixième co-inventeur	Full name of sixth joint inventor
Signature de l'inventeur Date	Inventor's signature Date
Domicile	Residence
Nationalité	Citizenship
Adresse postale	Post Office Address
Nom complet du septième co-inventeur	Full name of seventh joint inventor
Signature de l'inventeur Date	Inventor's signature Date
Domicile	Residence
Nationalité	Citizenship
Adresse postale	Post Office Address